Minnesota Water Sustainability Framework

Recreational/Spiritual/Cultural
Technical Work Team Report

August 2010

Key Findings

[to be added]

Introduction

Water is a part of Minnesota's identity, roots, and spirit. A fundamental human desire is to be near water—clean water—and the natural resources it supports. This desire to connect with water drives tourism, community involvement and activism, and, to a great extent, our state pride or identity. Minnesota's businesses and enterprises also rely on clean water, but global economic forces place additional external pressure on Minnesota's resources, while not necessarily reflecting the environmental policies, priorities and values that have historically been supported.

One way to understand water is to consider how it is valued, for that will influence how it's used, managed and planned for. Objects themselves have no value unless an importance is attached to them. For example, a river is an ecosystem that affords opportunities to fish, swim, boat, canoe or kayak, grow wild rice, and shelter spawning fish, as well as has value just as it is. Our modern patterns of resource use, whether to simply put food on the table or for more recreational purposes, still fundamentally connect us to the water and remind us of the abundance w ater can provide. However, the values associated with any of these opportunities are socially constructed and may differ among stakeholders, geographic regions, places of residence, and socio-demographic characteristics (Bengston 1994; Steel, List, and Shindler 1994; Williams and Patterson 1999). Values are statement of "a relationship, an estimation of worth of some object to an individual or in particular situation" (Andrews and Waits 1980, 71). The systematic incorporation of public values in natural resource management, planning and policy formulation is critical (Bengston 2000; Hetherington, Daniel and Brown 1994). Enhanced value comprehension is beneficial in that it promotes ethical land use decisions, enables appropriate goal establishment, assists managers in assessing public reaction to management practices, informs natural resource conflict resolution and allows managers to be responsive to the evolving social environment (Bengston 1994; Bengston, Fan, and Celarier 1999).

A variety of value frameworks exist. Bengston (2000) presented a framework that considers values as instrumental or non-instrumental: valued for what its use toward something else or valued for itself. Instrumental is further divided into economic and environmental areas while non-instrumental is further divided into spiritual as well as aesthetics. Non-instrumental values may also be identified as "intangible values" or those "that which enrich the intellectual, psychological, emotional, spiritual, cultural and/or creative aspects of human existence and well being" (World Conservation Union 2000). While other frameworks exist, we found this

framework useful as a basis to understand how recreational/cultural/spiritual values relate to other areas important for water sustainability.

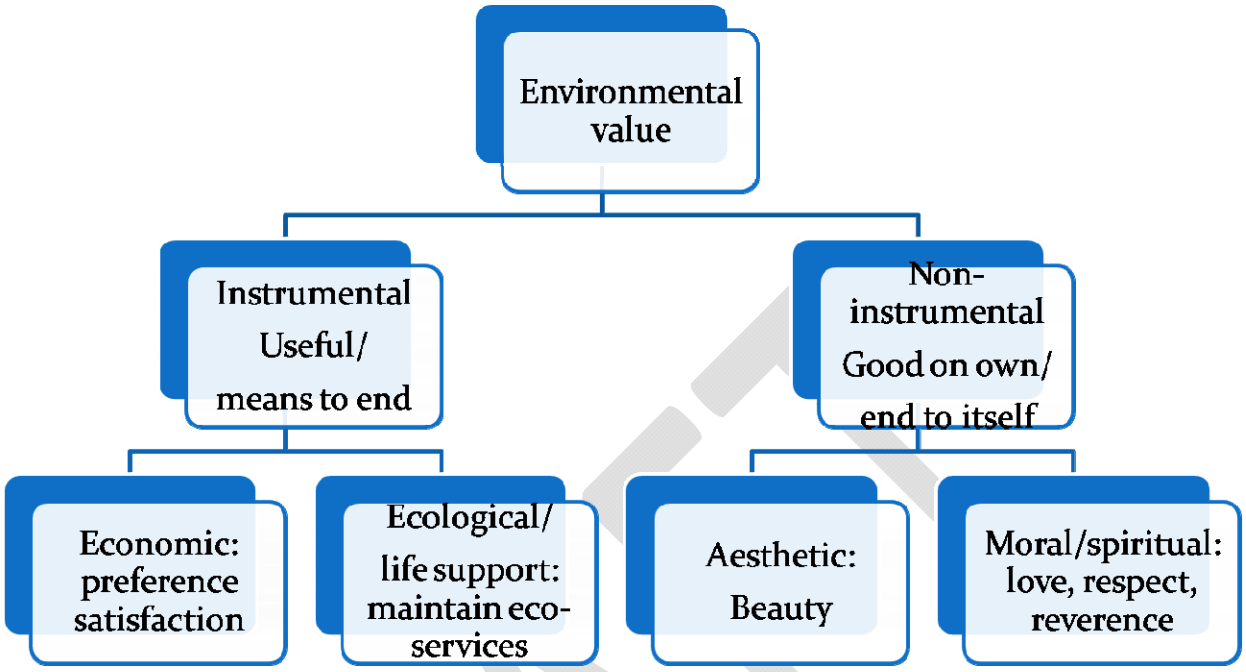

FIGURE 1. Value framework (Bengston, 2004)

Team Charge, Members, and Process

The recreational/spiritual/cultural technical work team was charged to develop a short white paper on issues of water use for recreational, spiritual, and cultural purposes in Minnesota for presentation to the Headwaters Council. The paper was directed to include: 1) knowledge about recreational, spiritual, and cultural uses of water, 2) gaps in what we know, 3) and a statement of issues to address in the Minnesota Water Sustainability Framework.

Team members were selected to represent different areas of the recreation, spiritual, and cultural knowledge bases (Appendix A). Each member was expected to understand specific needs to water, correspond to different government and nonprofit agencies, connect to a diversity of people, as well as provide expertise and analysis in recreational, cultural, and/or spiritual aspects of water use.

The team met three times to discuss related issues, gaps, and needs. The meetings consisted of presentations from experts; research on water resources as applied to recreation, spiritual, and cultural use (Appendix B, Appendix C, Table 1); brainstorming and establishment of primary issues (Appendix D), and continual refining of issues through collaborative worksheets and discussion sessions. The team framed each issue to address additional protection, preservation, and enhancement of the quality and quantity of Minnesota's waters.

Issues, Needs, and Gaps

With more than 11,000 lakes larger than 10 acres in Minnesota, lakes are the hallmark public resource of the state (Anderson et al. 1999). In addition to lakes, Minnesota's 69,200 miles of water resources include nearly 600 miles of state or nationally designated wild and scenic rivers. Also, nearly 4,400 miles of water trails are managed for canoeing and kayaking. Wetlands also contribute to Minnesota's abundant water resources with approximately 870,000 wetlands covering 10 million acres (MNDNR 2009a). Minnesota's water resources are unique in that we are home to the headwaters of the Mississippi, the Minnesota River, Lake Superior and the Boundary Waters Canoe Area Wilderness.

These resources provide a wealth of water-based recreation opportunities and are significant sources of cultural and spiritual values (Appendix C, Table 1). The following pages highlight important elements of 13 issues identified by the recreational/cultural/spiritual team. We grouped these issues in three categories: values, factors influencing values and collateral factors. Values include sacredness, quality of experience, access, sustenance and economics. Factors influencing the values include pollution, climate change, multiple/competing uses, and invasive species. Finally, the collateral factors include treaty rights, education/communication/advocacy and policy.

Values

The team discussions resulted in five primary water-based values: sacredness, quality of experience, access, sustenance and economics. Each of these is briefly discussed, given the page constraints for the paper (about 10 pages). Following the discussion, we identify several information gaps within each area with respect to recreational, cultural and spiritual values for water in Minnesota.

Sacredness. Water is an essential part of every Minnesotan's cultural identity, in our modern uses and connections to water resources, and for cultures with an ancient reliance on water for survival. When viewed through the lens of 'sacredness,' it becomes intuitive that any alteration or destruction of aquatic habitat or fouling of waters by polluted runoff or discharges, is a desecration of this very essence of life. Across cultures and religions worldwide, water is central to stories of creation and healing, and can be a symbol of grace (for example, its use in Christian baptism) or purification (the sacred Hindu River Ganges purifies bathers of their sin). In other cultures, water is reflection or image of the soul. The identification of sources of rivers, streams, springs, or wells as sacred is an ancient paradigm; the sacred waters could ensure life, health and abundance (Witcombe).

Water has played a fundamental role in the history of human presence in this place. The Ojibwe migration story is linked to a series of visions which led the Ojibwe people westward through the St. Lawrence seaway and the Great Lakes to a number of stopping places, the last of which was revealed as 'the place where food grows on the water' (Warren 2005). Manoomin, or wild rice, is considered a gift from the Creator; as much medicine as it is food for subsistence, and even today is a defining element of tribal culture. Traditional cultural and ceremonial practices such as sweat lodges require clean, pure water, and in turn the water provides healing. European settlement was initially linked to the abundance of furbearing mammals, and today's diverse immigrant cultures

(Hmong, Somali, Hispanic) are also integrally linked to the resources that water provides, especially fish for consumption.

Water has also represented mobility, providing a highway for ancestral tribal cultures who moved from fishing camps to ricing camps to hunting grounds, following a seasonal pattern of resource use that took advantage of abundant resources while they were most readily available. Living near rivers, they developed an efficient means of transportation, building birch bark canoes constructed with the resources at hand. Today, canoes and kayaks are widely used as recreational transportation, and serve to connect people with water in a way that is largely unchanged from ancient times.

Our experiences on and near the water can shape a renewed reverence for all that it offers: physical and spiritual nourishment as well as aesthetic sustenance. Failure to honor the cultural and spiritual values of water will lead to the failure of political leaders and decision-makers to provide for a sustainable water future.

Information gaps: survey on Minnesotans' values associated with water; mechanism for focusing on the commonalities of values for water across demographic sectors

Quality of Experience. Minnesotans value their water-based experiences and the quality of these experiences is subsequently important. A 2005 study revealed four-fifths of all Minnesotans claim outdoor recreation is at least "moderately important" in their life (MNDNR 2005). A 2007 survey of state park users indicates this importance is higher among visitors, rising to 99 percent among more frequent visitors (MNDNR 2008).

Quality water-based recreation experiences are available in Minnesota across a range of settings, from wilderness to urban areas. These settings are combinations of desired physical environments, levels of management presence and social factors (USDA FS 1979; Auckerman, Haas, Lovejoy, et. al. 2004). Providing quality experience opportunities across these settings is an ongoing challenge as both population and natural resource-based recreation activities continue to develop and diversify (Manning 2000). Physical environments are challenged by visitor-induced impacts, development pressures and pollution. The management environment must continually evolve as new activities and technologies emerge. Similarly, the social environment gradually evolves as the population diversifies and ages and, as such, the management environment must respond. Retaining the range and quality of settings is essential.

Primary reasons for water-based recreation include: to experience nature, to escape the pressures of daily life, to experience quiet, to get or stay physically active, and to be with friends and family (Driver 1977; MNDNR 2008). The importance of recreation motivations differ by a variety of factors, including age and ethnicity. For example, a 2007 Minnesota state park visitor study revealed that older adults place greater emphasis on learning-related experiences (experience a sense of history, learn about nature), while young adults want more to achieve and be stimulated (taking risks, being active, feeling exhilarated, being adventurous; MNDNR 2007). National research indicates that outdoor recreation participation among 6 to 17 year-olds dropped 16.7 percent between 2006 and 2008 (The Outdoor Foundation 2009). In Minnesota, the Minnesota Department of Natural Resources (2008) reported that the steepest declines in outdoor recreation are for young adults (under 45) and their children. With regards to experiences by

non-dominant cultures, limited data exist. Focus groups with Hmong in Minnesota revealed that harassment and racism were a problem in both Minnesota and Wisconsin outdoor recreation areas (Bengston, Schermann, Moua, et al. 2008). Similarly, Wilhelm Stanis, Schneider, Chavez, et al. (2009) found that non-dominant cultural groups in Minnesota and elsewhere felt significantly more unwelcome and fearful in the outdoors than the non-Hispanic whites.

Constraints to such recreation experiences must be recognized so that interest and participation in water-based recreation experience can continue. As reported elsewhere (Schneider, Davenport and Oftedal 2010), Minnesota-based research documents that time and family obligations are among the most constraining factors across the Recreation Opportunity Spectrum (MNDNR 2008; Wilhelm Stanis, Schneider, Shinew et al. 2009; Schneider, Schroeder, and Schwaller 2010). Important to consider given Minnesota's changing demographics, constraints change through time, depending on an individual's life stage (Schneider, Schroeder and Schwaller, 2010; Green, Bowker, Johnson, et al. 2007). Although data on non-white Minnesotan's is wanting, focus groups with a variety of racial/ethnic groups in Oregon revealed a lack of information and transportation particularly problematic for Asians and Hispanics (Burns, Covelli, and Graefe 2008).

Of particular relevance to quality of water-based experiences are the viewscapes and sound-scapes. Given the importance of being in nature and a natural environment for recreation experiences, scenic quality is essential. Scenic quality includes the appearance of both the land and air. Though visual resource management guidelines exist (e.g. USDA Forest Service and Minnesota Department of Natural Resources), they are unevenly applied on the ground. While quiet environments have long been appealing for recreation and essential for various cultural/spiritual ceremonies, systematic research into natural sounds is only in its initial phases (e.g. Manning, Newman, Fristrup, et al. 2009). When recreationists are unable or prevented from attaining the recreation experiences they seek, the quality of that experience is compromised. Similarly, unwanted (or unnatural?) noise can impact cultural/spiritual ceremonies.

Information gaps identified: value of quality experiences, differences in perceived recreation quality among racially/ethnically diverse groups, longitudinal understanding of quality of recreation experiences, impact of various noises to experiences (recreation and cultural/spiritual)

Access. Minnesota may be the land of 10,000 lakes, but it is a state in which not all residents have desired access to water resources to meet their recreational, spiritual and cultural needs. We are a state with laws granting rights of access to public waters for its citizens, but are increasingly finding those public waters blocked by expanding private shoreline development. Certain ethnic communities describe unwelcoming experiences in places with public waters, thereby depriving them of equitable access. Older citizens and people with disabilities may be restricted in their chances to experience Minnesota's land of water. And our aquatic-dependent wildlife is increasingly experiencing degradation of water quality that they require for survival. Further, recreation management suggests that a range of water-recreation experience opportunities be provided to address the breadth of desires and potential benefits (Driver, Brown and Peterson 1991; Driver 2009). As public water access increases, an area moves closer to the urban end of the recreation opportunity spectrum. Beyond human access, a number of species are water-dependent and need access to high quality water bodies for their survival.

Under Minnesota's statutes, landowners can exclude anyone from their land. However, Minnesota statues also state that everyone has riparian rights when it comes to using public waters. It is possible for a body of water to be entirely closed to public use because the shoreline is entirely owned by private individuals. Minnesota's public water access program was founded in the early 1940s in order to acquire, develop and maintain public water access sites to preserve opportunities for water recreation activities (N. Stewart, pers. comm. 2010). Human-related access issues encompass not only actual physical access, but also the perception of access. Some public perception is that access to Minnesota water bodies, lakes in particular, is decreasing. The perception is driven by increasing development along lake and river fronts. Notably, additional access points are being developed at the state level (E. Wrede, pers. comm. 2010).

Further, there may be a perception that access is reserved for the dominant population (in 2010, non-Hispanic White). The limited data available indicate non-dominant groups feel more unwelcome than the dominant groups (Bengston, Schermann, Moua, et al. 2008; Wilhelm Stanis, Schneider, Chavez, et al. 2009) Alienation of non-dominant groups from recreation and conservation areas poses a problem in that all non-dominant populations are expected to see growth across Minnesota through 2035 (Minnesota Department of Administration (MDOA) 2009). Specifically, the Latino population is projected to increase almost 200 percent, growing from an estimated 196,300 residents in 2005 to 551,600 in 2035. Similarly, the African American and Asian/Pacific Islander communities will double in size by 2035. Therefore, as the non-dominant population is expected to increase – and because non-dominant segments describe feeling unwelcome – a concern is that problems with “access” to water resources may increase over time rather than the problem improving.

Accessibility typically changes as we age and, according to the 2007 Minnesota state demographer (MDOA 2007), Minnesota’s population older than 65 will increase 125 percent through 2035. As such, attention to consideration for universal design or minimally access following the Americans with Disabilities Act (1990) will be necessary, balanced with the challenge of infrastructure and maintenance costs. According to the Department of Natural Resource’s *2004 Outdoor Recreation Participation Survey of Minnesotan*, rural residents, people older than 65, and non-dominant populations tend to spend less time recreating outdoors than others. On a related note, economic imbalance among citizens translates into inequity in access: to political leaders, to clean water, to recreational, spiritual and cultural resources. Managers should consider both real and perceived accessibility of water resources for diverse populations.

Importantly, costs are incurred to provide physical access (e.g., the estimated infrastructure costs for an accessible fishing pier). Similarly, a full benefits-cost analysis of water-based projects would include the impact of access to the terrestrial and aquatic life. Complicating public access are the individual private landowners rights who may view providing public access as both a legal liability and nuisance. Similarly, access to sacred sites can be viewed as a commercialization and a conflict among those who find them sacred (Salk and Schneider 2010).

Information gaps: data on access by desired recreation experience across water bodies (swimming, boating by type, etc.); status of accessible facilities for water bodies per Americans with Disabilities Act; state and regional data on boat size (motor size; horsepower) and impacts of various horsepower on shoreline vegetation, as well as fuel, GAO and National Boat Manufacturing; boat size use on lakes; regulations for water/management/habitat.

Sustenance: Wild Rice, Wildlife, and Waterfowl. This issue is intended to encompass the range of what waters provide to sustain life and health (nutrition or nourishment), as well as that which sustains the mind or spirit (our recreational, cultural, and spiritual reliance upon waters).

Wild rice was historically abundant throughout the Upper Midwest, especially in Minnesota, Wisconsin and Michigan's Upper Peninsula. Today, the range of natural stands of wild rice is diminishing, due to multiple and cumulative effects of altered hydrology, pollution, invasive species, and now global climate change. The significance of wild rice ("manoomin" in Ojibwe) to the Ojibwe cannot be overstated; it is considered a gift from the Creator, and is essential to their traditional, spiritual, cultural, medicinal, social, educational, recreational, and economic well-being. It can provide seasonal income to tribal and state harvesters, in addition to its nutritional subsistence value.

Declining stands of natural wild rice have been linked to altered hydrology, such as extensive ditching that drains a rice bed, or inundation from dams or industrial discharges that overwhelms the shallow-rooted plants. The effects of global climate change are predicted to include changes to natural hydrology, and will likely aggravate existing impacts of development and land use changes on the unique and very specific hydrologic conditions that wild rice requires. Aquatic invasive species, both plant and animal, can reduce vigor, stand density and rice production, and outcompete this annual grass for available habitat. Declining wild rice has also been linked to industrial discharges high in sulfate concentrations, such as from mine pit dewatering or seepage from tailings basins. Tribal harvesters and state harvesters of natural wild rice have grave concerns about impacts from genetically modified wild rice, and have worked with the legislature to reach agreement on how best to protect natural wild rice while enabling the cultivated wild rice industry to improve production.

While the significance of protecting and restoring our state grain is clear, natural wild rice beds also represent important, complex aquatic ecosystems, and support an abundance of wildlife and waterfowl. Where healthy stands of wild rice persist, so do diverse animal and plant communities; the presence or absence of natural wild rice can be an indicator of broader ecosystem health.

Although wild rice remains a significant cultural, subsistence, and economic resource for Minnesota, there are few regulatory protections in place, and little application or enforcement of the single existing state water quality criterion for sulfate that is intended to protect waters used for the production of wild rice. Ensuring the sustainability of this invaluable aquatic resource will require research and funding for effective restoration and habitat protection, and may also suggest the need for broader regulatory protections.

Every spring, Minnesota celebrates its shared cultural heritage with the Minnesota fishing opener. A smaller segment of our community feels just as passionate about opening day of the duck season. Our modern patterns of resource use, whether to simply put food on the table or for more recreational purposes, still fundamentally connect us to the water and remind us of the abundance it can provide.

Widespread fish consumption advisories throughout the state are a grim reminder that legacy and ongoing pollution sources prevent us from fully enjoying the demonstrated health benefits of eating fish. There are over 1800 waterbodies (lakes and streams) in Minnesota with listed water quality impairments, and nearly 1300 of those impairments are for mercury in fish tissue, or mercury concentrations in the water column. Mercury is the most widespread fish contaminant, and mercury emission reductions defined in the statewide mercury Total Maximum Daily Load (the state's plan for reducing this impairment) if achieved, are not sufficient to result in lifting these consumption advisories on many of the state's waters. Restrictions on the amount of fish that can be safely eaten also represent a degradation of treaty-protected rights to harvest and consume fish from usual and customary places.

Management of these resources is, by definition, a complex process that must address sometimes conflicting goals (i.e., managing fisheries for certain species or size classes, or managing for healthy ecosystems while facing pressure from interest groups to favor certain resources over others). But sustaining recreational and traditional fishing and hunting in Minnesota undoubtedly depends upon maintaining or improving water quality and aquatic habitat.

Information gaps: data on trends in wild rice presence and productivity, information on implementation of the statewide mercury TMDL, information on aquatic habitat protection and restoration.

Economic Value. Water has multiple economic values for recreation and cultural areas. Water-based outdoor recreation experiences are part of Minnesota's $11 billion tourism industry (Explore Minnesota Tourism 2009) and significant outdoor recreation industry. Estimates for fishing suggest that fishing in Minnesota (residents and nonresidents) accounted for $2,725,366 in expenditures whereas wildlife viewing accounted for $698,889 of total expenditures in 2006 (U.S. Department of the Interior and U.S. Census Bureau 2007).

Communities and regions benefit economically from water-based outdoor recreation as visitors eat, shop, and stay in gateway communities. Entire communities and regions have transitioned into tourism destinations based on water-recreation, such as Ely and Brainerd. Property values are enhanced by the presence of water, especially when good water quality is preserved (Krysel et al 2003). Further, the contribution water makes to the overall quality of life likely influences personal and organizational decisions to relocate. Sustaining Minnesota's reputation as a premier recreation destination fundamentally depends upon maintaining and improving water quality.

Among the indirect economic benefits derived from water-based outdoor experiences, health-related economic benefits are important. Obese individuals spend around 36% more on health services than the general population (Strum 2002). In Minnesota, estimates based on historical spending estimates indicates a 7.5% increase in health care costs between 2008 and 2018 with the public share about 42% of the $78.5 billion projected costs (Gillespie 2010). As of 2007, only 48.8% of the U.S. population met the recommended levels of physical activity, defined as at least 30 minutes of moderate intensity physical activity five or more days of the week or 20 minutes of vigorous intensity physical activity three or more days per week (Centers for Disease Control and Prevention [CDC] 2008b). In the U.S., 63.0% of adults are either overweight or obese (CDC 2008a), and poor diet and physical inactivity may be responsible for as many as

365,000 U.S. deaths annually (Mokdad, Marks, Stroup, et al. 2004). In Minnesota, about 60% are overweight and 17% obese (Minnesota Department of Health 2010). As recreation is an important vehicle for physical activity which, in turn, reduces obesity, attention to increasing participation is essential.

Information gaps: local water-based recreation and tourism expenditure estimates; cost-benefit analyses of water-development decisions; health care cost reduction from participation in water-based recreation

Factors Influencing Recreational/Cultural/Spiritual Values

The team identified at least three factors that influence the values related to water: pollution, climate change, multiple/competing uses, and invasive species.

Pollution. Pollution is contrary to any common definition of sustainability. Protection and enhancement of water quality is a cross-cultural value, important to all. Water quality directly affects wildlife and other resources (moose, fish, waterfowl, wild rice, etc.), and plays a key role in public health, both directly (drinking water supply, recreational contact, spread of disease), and indirectly (food/dietary sources, safety).

The environmental manifestations of water pollution are enormous and wide-ranging: degraded fisheries (due to mercury and other bioaccumulative contaminants), degraded waterfowl and wildlife habitat, increased human health risks and exposures, harmful and ecologically disruptive algal blooms, sedimentation, thermal pollution (affecting coldwater-dependent species). Sources can be as diverse as air deposition of global pollutants, or as direct as contamination from latrines along lakeshores. Pollution not only adversely impacts the aesthetics of a water body (e.g., for swimming), but also human health and safety through contact or ingestion.

Funding required to fully address impaired waters in Minnesota greatly exceeds available resources, and our best available technologies for monitoring new or emerging contaminants of concern are not yet sufficient to accurately define the risks to the public or lead to specific regulatory controls. But beyond monitoring and treatment technology needs, Minnesota must also cultivate a stronger sense of public stewardship of water resources. New, improved tools for economic valuation, such as a cost-benefit analysis that clarifies the public's cost liabilities related to pollution vs. the value of providing for full recreational, cultural and spiritual uses, may help guide future decisions.

Climate Change. Global climate change will overlay additional, unpredictable and cumulative impacts to Minnesota's water resources, beyond those impacts we can currently observe and measure: pollution, sedimentation, eutrophication, land use changes, habitat loss and degradation. Some of our most precious and unique resources, such as Lake Superior and the BWCAW, are likely to experience the earliest and most devastating impacts of climate change, according to current predictive models (Kling et al 2003).

Climate change will likely impact both water quality and water quantity, in turn affecting our spatial and temporal recreational uses of water resources and creating adverse implications for tourism-dependent communities. Recreational impacts may include shortened seasons (i.e., less

ice cover, earlier ice-out), "flashier" precipitation events and/or prolonged dry periods that translate into greater uncertainty for recreation service providers. There may be a general human population migration northward in pursuit of a more favorable climate, leading to added pressures on water resources and recreational infrastructure. The impacts to traditional recreational opportunities (fishing, boating, canoeing/kayaking, swimming) may include increasing constraints on timing/seasons, access, and quality of experience.

Impacts to water quality and quantity will also affect cultural water uses, such as wild rice harvest and subsistence fish consumption. Altered hydrology and warmer mean water temperatures will shift biological assemblages, both plant and animal species, and may profoundly change the resources available to future generations. For instance, Minnesota's moose population is already exhibiting high mortality rates that can be linked to stress from a warming climate: greater susceptibility to parasites and disease, greater energy expense to keep cool (Lange 2007). The warmer temperatures may exacerbate mercury contamination in fish tissue, and accelerate introductions of invasive species that are now temperature-limited.

Climate change is a global problem, yet there are few, if any, global solutions at hand. Our waters and associated natural resources are finite, but there are limited approaches for mitigation and adaptation. There is still uncertainty, whether real or perceived, about the science of climate change, and that uncertainty restrains socially and politically acceptable strategies and actions.

Multiple Use/Competing Use. Like any valued resource, abundant competition for the use exists. The general public, industry, various stakeholders and government have water use priorities that do not always coincide. To illustrate this, one framework identifies several sources of conflict: visitors, managers, community officials and residents, and government (Little and Noe 1984). These sources interact in multi-dimensional ways, leading to an interactive framework with nine levels of conflict and opportunities for conflict management (Figure 2).

Of particular concern for recreational and cultural/spiritual areas are the challenges of multi-jurisdictional areas where authority is not always clear, decisions where full cost-benefit analysis is not readily available or accessible, and when decisions are not informed by the best available science. Decisions of particular interest include those related to water flows, development, and cultural/spiritual issues.

Information gaps: details on public involvement and actual public ideas integration into decision making process, full cost-benefit analysis of resource decisions, and ways to more effectively and quickly disseminate the best available science.

Invasive Species. Invasive species cause ecological or economic problems to a local area and beyond. Specific to water, invasive species impact the perceived quality of water, its accessibility for recreational activities, the health and productivity of native species, and the accessibility for cultural practices.

Given the sacredness of water environments and the reliance of indigenous cultures on wild rice, invasive species pose an imminent and ominous challenge. Invasive species are spread unintentionally by boats, animals, vehicles, produce, footwear, and clothing (Minnesota Department of Natural Resources 2009b). Similarly, given the extent of outdoor recreation

dependent on water, the interaction between recreationists and water-based invasive species is significant.

Many educational and regulatory approaches to invasive species have been taken or are in process. However, a 2009 literature review revealed that educational campaigns related to invasive species appear very limited and evaluation of these educational campaigns is non-existent in the published literature (Schuweiler and Schneider).

Information gaps: level of education/awareness about invasive species and helpful/harmful actions across individuals and organizations, appropriateness of funding levels to problem magnitude, treatment effectiveness, full cost-benefit analysis of impact and treatments, specific vectors, regulation effectiveness

Collateral Factors

The team identified three factors related to water-based values that involve action with the capacity to influence water's recreation/cultural/spiritual aspects. In some cases these are actions to take; in other instances, they represent existing actions and influences upon the other issues we present. These three factors are treaty rights, education/communication/advocacy and policy.

Treaty Rights. The rights to hunt, fish and gather within lands that were ceded by Native American tribes to the U.S. government are retained in perpetuity for the physical, cultural and spiritual well-being of tribal members, but these federally protected usufructuary rights are not fully recognized by state government, nor widely understood or respected by the general public. Yet, fundamentally, the ability to exercise those treaty rights is completely dependent upon clean water and healthy ecosystems: the very basis of sustainable resource use.

The lack of consideration for treaty rights leads to potential conflicts between policies and regulations, and the ability to continue traditional spiritual and cultural practices. When treaty rights are not honored or exercised, it limits a traditional, cultural way of life and results in a loss of traditional practices; as traditions are erased, assimilation is imposed. Subsistence living and maintaining cultural practices are how modern tribal members preserve links to their ancestral generations, and still engage in contemporary society; for example, harvesting, finishing and marketing wild rice is a source of seasonal income to many tribal members today.

Traditional oral teaching is to "take only what you need and leave the rest." This ideology is essentially a sociocultural control for protecting the resource for future use; modern harvest limits and management activities are more of a political construct. Traditional harvests represented much more than simply the acquisition of food; they were seasonal gatherings that also included socializing and visiting. The Native American view of the world may be described as continuous 'stewardship' of the resources provided by the Creator, rather than an 'ownership' perspective that precludes others' ability to use the resource. This model or perspective would serve us well to emulate, if we are committed to a sustainable water future for Minnesota.

Education/Communication/Advocacy. Education about water is essential for a variety of reasons, as detailed by the education technical work team (Education Technical Team 2010). Unique and important aspects related to recreation and cultural/spiritual areas include:

environmental education curriculums, the relationship between awareness and action, and recreational education campaigns for low impact use.

While Minnesota provides a formal environmental education curriculum for fifth graders, having just one required point of environmental education contact poses a serious concern and impediment to life-long appreciation for and understanding of the environment as a whole and water, specifically. As such, the lack of awareness about water and its multiple values impedes desired behaviors toward water conservation and quality retention.

Specific to outdoor recreation education, a longstanding program of low-impact behavior exists and is used for state and federal agencies: leave no trace. This program of seven principles encourages low-impact behaviors to maintain or improve resources (Leave No Trace 2010). Curricula such as these focus specifically on target groups and can be considered for further expansion.

Information needs: level of awareness and education among a variety of individual and organization entities, educational program effectiveness and impact on specific behaviors

Policy. Revising Minnesota's water resources policies to provide for sustainability will be challenging. Existing policies and regulations are not consistently enforced, and critical sectors or industries are not always subject to regulations or source controls. In fact, there often appears to be a disconnect between water policy and standards and their implementation (e.g., lack of effluent limits or monitoring requirements established in permits; ongoing variances issued for noncompliant facilities; transfer of waters between watersheds and aquifers).

Regulatory agencies are faced with considering multicultural priorities, and there are multiple jurisdictions (local, state, federal, tribal) with varying regulatory authorities and capacities. Current economic and cost-benefit analyses do not accurately or adequately account for the benefits of clean water or related natural resource values, or even attempt to quantify the spiritual or cultural values of water.

Economic imbalance among citizens translates into inequity in access: to political leaders, to clean water, to recreational, spiritual and cultural resources. Those with financial wealth and political influence tend not to represent the full spectrum of perspectives, but are often able to advance their individual, not statewide interests.

Policy provides the necessary framework for the regulations that minimize and/or mitigate impacts to water resources. Citizen input to the creation of legislation is critical for ensuring that comprehensive and inclusive values and perspectives are recognized. If there is not sufficient, effective policy in place to protect Minnesota's internationally important water resources, global pressure may drive the development paradigm of a "resource colony". Again, the future sustainability of Minnesota's waters requires that we acknowledge and respect the fact that our precious waters are a limited resource.

Water resources policies are challenging because existing policies aren't always enforced, important sectors/issues are not regulated in the first place; they present the need to accomplish difficult multi-cultural and jurisdictional management, and accurate cost-benefit analysis is not traditionally inclusive of clean water/natural resource values. As a policy issue, it is the

responsibility of legislature to protect our resources for the future – we received this Legacy from our forebears and are called on to preserve them for those who will follow.

Information needs: Process or mechanism for conflict resolution in developing sustainable water policy

References

Anderson, K. A., T. J. Kelly, R. M. Sushak, C. A. Hagley, D. A. Jensen, and G. M. Kreag. 1999. *Summary report on public perceptions of the impacts, use, and future of Minnesota lakes: Results of the 1998 Minnesota lakes survey.* A joint publication by the University of Minnesota Sea Grant Program (SH 1) and Minnesota Department of Natural Resources. Office of Management and Budget Services. St. Paul, MN.

Andrews, R. N. L., and M. J. Waits. 1980. Theory and methods of environmental values research. *Interdisciplinary Science Reviews* 8, no. 1:71-78.

Bengston, D. N. 1994. Changing forest values and ecosystem management. *Society and Natural Resources* 7: 515-533.

Bengston, D. N. 2000. Environmental values related to fish and wildlife lands. *Human Dimensions of Natural Resource Management: Emerging issues and practical application*. A Cooperative Park Studies Program. University of Minnesota, Department of Forest Resources. St. Paul, MN.

Bengston, D. N., D. P. Fan, and D. N. Celarier. 1999. A new approach to monitoring the social environment for natural resource management and policy: The case of US national forest benefits and values. *Journal of Environmental Management* 56: 181-193.

Bengston, D. N., M. Schermann, M. Moua, and T. T. Lee. 2008. Listening to neglected voices: Hmong and public lands in Minnesota and Wisconsin. *Society and Natural Resources* 21, no. 10: 876-890.

Center for Outdoor Ethics. Leave No Trace. 2010. Leave no trace principles. http://www.lnt.org/programs/principles.php (accessed July 6, 2010).

Driver, B. L., P. J. Brown, and G. L. Peterson, eds. 1991. *Benefits of Leisure*. State College, PA: Venture Publishing.

Driver, B. L. ed. 2009. *Managing to optimize the beneficial outcomes of recreation*. State College, PA: Venture Publishing.

Educational Technical Team. 2010. Draft report for the Statewide Water Sustainability Framework. University of Minnesota Water Resource Center, St Paul, MN

Explore Minnesota Tourism. 2009. Tourism and the economy brochure. St Paul, MN.

Gillespie, T. 2010. Presentation to the Parks and Trails Planning Team, January. St. Paul, Minnesota.

Green, G. T., J. M. Bowker, C. Y. Johnson, H. K. Cordell, and X. Wange. 2007. An examination of constraints to wilderness visitation. *International Journal of Wilderness* 13: 26-36.

Hetherington, J., T. C. Daniel, and T. C. Brown. 1994. Anything goes means everything stays: The perils of uncritical pluralism in the study of ecosystem values. *Society and Natural*

Resources 7:535-546. http://www2.icma.org/main/ld.asp?ldid=18012&hsid=1&tpid=31 (accessed April 10, 2006.)

Jackson, E. L. 2000. Will research of constraints still be relevant in the twenty-first century? *Journal of Leisure Research* 32, no. 1: 62-69.

Kling, G. W. et al, 2003. *Confronting Climate Change in the Great Lakes Region: Impacts on our Communities and Ecosystems*. Released by the Union of Concerned Scientists and the Ecological Society of America. http://www.ucsusa.org/greatlakes/glchallengereport.html.

Krysel, C. E. M. Boyer, C. Parson, and P. Welle. 2003. *Lakeshore Property Values and Water Quality: Evidence from Property Sales in the Mississippi Headwaters Region.* Submitted to the Legislative Commission on Minnesota Resources by the Mississippi Headwaters Board and Bemidji State University.

Lange, N. 2007. *A Whole New Game: The effects of climate change on hunting, fishing, and outdoor recreation in Minnesota*. Izaak Walton League of America, Midwest Office: St. Paul, MN.

Manning, R. E. 2000. *Studies in Outdoor Recreation*. Corvallis: Oregon State University Press.

Manning, R., P. Newman, K. Fristrup, D. Stack, and E. Pilcher, (2009-2010). A program of research to support management of visitor-caused noise at Muir Woods National Monument. *Journal of Park Science* 26, no. 3: 54-58.

Minnesota Department of Administration. 2007. *Minnesota Population Projections 2005-2035*.. http://www.demography.state.mn.us/documents/MinnesotaPopulationProjections20052035.pdf (accessed June 10, 2010).

Minnesota Department of Administration. 2009. *Population Notes: Minnesota Population Projections by Race and Hispanic Origin, 2005 to 2035*. http://www.demography.state.mn.us/documents/MinnesotaPopulationProjectionsbyRaceandHispanicOrigin2005to2035.pdf (accessed June 10, 2010).

Minnesota Department of Health. Environmental Health Division. Environmental Surveillance and Assessment Section.. 2009. *Building on Existing Knowledge: Updating Minnesota's Fish Consumption Educational Outreach for the Hmong Community*. By Eshenaur, T., P. McCann, and Berglund in cooperation with U.S. Environmental Protection Agency (EPA) and the U.S. Agency for Toxic Substances and Disease Registry (ATSDR). M. E Great Lakes Consortium Fish Guidelines Outreach Project. Department of Public Health, Environmental Health. St. Paul-Ramsey County, MN.

Minnesota Department of Natural Resources (MNDNR). 2001. *Survey of sea kayak owners in Minnesota: Kayaking the North Shore of Lake Superior study.* Prepared by the Office of Management and Budget Resources. St. Paul, MN.

Minnesota Department of Natural Resources (MNDNR). 2004. *Recreational boating study of the Mississippi River, Pools 4 to 9, Summer 2003*. Prepared by the Office of Management and Budget Resources. St. Paul, MN.

Minnesota Department of Natural Resources (MNDNR). 2005. *2004 Outdoor recreation participation survey of Minnesotans: Report on findings.* Prepared by Tim Kelly. Office of Management and Budget Services. Saint Paul, MN.

Minnesota Department of Natural Resources (MNDNR). 2005. *Minnesota canoe and kayak study*. Prepared by the Office of Management and Budget Resources. St. Paul, MN.

Minnesota Department of Natural Resources (MNDNR). 2008. *2007 Minnesota State Parks Research Summary Report*. Prepared by Tim Kelly. Office of Management and Budget Services. Saint Paul, MN.

Minnesota Department of Natural Resources (MNDNR). 2008. *Natural Wild Rice in Minnesota: A Wild Rice Study document submitted to the Minnesota Legislature by the Minnesota Department of Natural Resources.*
http://files.dnr.state.mn.us/fish_wildlife/legislativereports/20080215_wildricestudy.pdf

Minnesota Department of Natural Resources (MNDNR). 2009a. *Boating in North Central Minnesota: Status in 2008 and Trends Since 1985*. Prepared by the Office of Management and Budget Resources. http://www.dnr.state.mn.us/index.html (accessed February 24, 2010).

Minnesota Department of Natural Resources (MNDNR). 2009b. *Invasive species.* http://www.dnr.state.mn.us/invasives/index.html (accessed July 6, 2010).

Mokdad, Ali H., James S. Marks, Donna F. Stroup, and Julie L. Gerberding. 2004. Actual Causes of Death in the United States, 2000. *Journal of the American Medical Association* 291: 1238-1245.

The Outdoor Foundation. 2009. *2009 Outdoor Recreation Participation Report*. Boulder, CO. http://www.outdoorfoundation.org/pdf/ResearchParticipation2009.pdf (accessed June 30, 2010).

Schneider, I. E., M. Davenport, and A. Oftedal. 2010. Summary Trends Report for Minnesota Parks and Trails Planning Process. Manuscript in preparation for Legislative Commission on Minnesota Natural Resources.

Schneider, I. E., S. Schroeder, and A. Schwaller. 2010. The wilderness visitor experience constrained. Manuscript submitted for publication.

Schroeder, S., and D. C. Fulton. 2006. *Fishing in the Neighborhood: A Study of Recreation and*

Fishing Participation in the Twin Cities Metropolitan Area. University of Minnesota, Minnesota Department of Fisheries, Wildlife, and Conservation Biology. Cooperative Fish and Wildlife Research Unit. St. Paul, MN.

Schuweiler, A., and I. E. Schneider. 2009. State of effective educational efforts to reduce the transport of terrestrial invasive species and applications for Minnesota. Report for Minnesota Department of Natural Resources.

Steel, B. S., P. List, and B. Shindler. 1994. Conflicting values about federal forests: A comparison of national and Oregon publics. *Society and Natural Resources* 7: 137-153.

Strum, R. 2002. The effects of obesity, smoking and problem drinking on chronic medical problems and health care costs. *Health Affairs* 21, no. 2: 245-253.

U.S. Department of Agriculture. Forest Service. 1977. *Item pool for scales designed to quantify the psychological outcomes desired and expected from recreation participation*. By Driver, B. L. Rocky Mountain Forest and Range Experiment Statio. Fort Collins, CO.

U.S. Department of Agriculture. Forest Service. 1979. *The Recreation Opportunity Spectrum: A framework for planning, management, and research*. By Clark, R., and G. Stankey., G., Pacific Northwest Forest and Range Experiment Station. Portland, OR.

U.S Department of Agriculture. Forest Service. 2003. *Extending the Recreation Opportunity Spectrum to nonfederal lands in the Northeast: An implementation guide*. By More, T. A., S. Bulmer, L. Henzel, and A. E. Mates. Gen. Tech. Rep. NE-309. Northeastern Research Station. Newtown Square, PA.

U.S. Department of Agriculture. Forest Service. 2008. *2007 Boundary Waters Canoe Area Wilderness visitor use study: Description of users and use characteristics*. By Dvorak, R. G., W. T. Borrie, and A. E. Watson. University of Montana, College of Forestry and Conservation. Rocky Mountain Research Station Research Work.

U.S. Department of Agriculture. Forest Service. 2008. *Outdoor Recreation and Nontraditional Users: Results of Focus Group Interviews with Racial and Ethnic Minorities*. By Burns, R. C., E. Covelli, and A. Graefe. Gen. Tech. Rep. PSW-GTR-210. Pacific Southwest Research Station. Albany, CA.

U.S. Department of Agriculture. Forest Service. 2010. *Outdoor Recreation Trends and Futures: A Technical Document Supporting the Forest Service 2010 RPA Assessment*. By Cordell, H. K. Unpublished Manuscript. Athens, GA.

U.S. Department of Health and Human Services. Centers for Disease Control and Prevention (CDC). 2008. *Behavioral Risk Factor Surveillance System Prevalence Data*. Overweight and Obesity (BMI). http://apps.nccd.cdc.gov/brfss/index.asp (accessed June 30, 2008).

U.S. Department of Health and Human Services. Centers for Disease Control and Prevention (CDC). 2008. *U.S. Physical Activity Statistics*. http://apps.nccd.cdc.gov/PASurveillance/StateSumResultV.asp (accessed June 30, 2008).

U.S. Department of the Interior. Bureau of Reclamation. 2004. *Water Recreation Opportunity Spectrum (WROS) Users' Guidebook*. By Aukerman, R., and G. Haas in cooperation with V. Lovejoy, and D. Welch. Office of Program and Policy Services. Denver Federal Center. Lakewood, CO.

U.S. Department of the Interior. Fish and Wildlife Service. 2007. *2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. In cooperation with the U.S. Department of Commerce and the U.S. Census Bureau. U.S. Fish and Wildlife Service. Washington, DC.

U.S. Department of the Interior. National Park Service. 1984. *A highly condensed description of the thought process used in developing visitor research for southeast parks*. By Little, W., and F. P. Noe. Southeast Regional Office. Atlanta, GA.

Warren, W. W. 2009. *The History of the Ojibway People*. Second Ed. Minnesota Historical Society Press.

Wilhelm Stanis, S. A., I. E. Schneider, D. Chavez, and K. Shinew. 2009. Visitor constraints to physical activity in park and recreation areas: Differences by race and ethnicity. *Journal of Park & Recreation Administration* 27, no. 3: 78-95.

Wilhelm Stanis, S. A., I. E. Schneider, K. J. Shinew, D. J. Chavez, and M. Vogel. 2009. Physical activity and the recreation opportunity spectrum: Differences in important site attributes and perceived constraints. *Journal of Park & Administration* 27, no. 4: 73-91.

Williams, D. R., and M. E. Patterson. 1999. Environmental Psychology: Mapping landscape meanings for ecosystem management. In *Integrating Social Sciences with Ecosystem Management*, eds. Cordell, H. K., and J. C. Bergstrom, 141-160. Champaign, IL: Sagamore Press.

Witcombe, C. 1998. *Sacred Places*: *An exploration of how and why places become invested with sacredness and how the sacred is embodied or made manifest through art and architecture.* Department of Art History. Sweet Briar College: Virginia. *http://witcombe.sbc.edu/sacredplaces/water.html*

World Conservation Union. World Commission on Protected Areas. 2000. *Sacred dimensions: Understanding the cultural and spiritual values of protected areas*. http://www.iucn.org/about/union/commissions/wcpa/wcpa_puball/wcpa_pubsubject/wcpa_culturalpub/?2090/Sacred-Dimensions (accessed July 2, 2010).

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